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THE POTENTIAL FOR REUSE OF ELECTRICAL AND ELECTRONIC EQUIPMENT. CONSUMER BEHAVIOUR

Waste electrical and electronic equipment (WEEE) is one of the fastest-growing waste streams. Technological progress and the failure rate of existing equipment are among the main factors that influence the frequency of replacement. The resulting electronic waste, according to the law in force, should be subjected to recovery processes, especially recycling. A key element in the management of WEEE is its collection. The objective of the study was to assess consumer attitudes towards the purchase and use of second-hand appliances and to verify the above-mentioned behaviour according to age, gender and place of residence. The study also analysed consumers' propensity to store unused appliances. Due to advances in technology, periodically hibernating them reduces the possibility of reusing them in the future. The storage of appliances also negatively impacts the increase in demand for virgin raw materials. Research showed that still few respondents (37.3%) choose to purchase used equipment. Most respondents (26.4%) choose to buy IT equipment. The main reason for purchase is their price. In addition, home storage of equipment is still common (63.7% of respondents).

1. INTRODUCTION

In 2019, approximately 54 Mt of electrical and electronic waste (WEEE) was generated globally. About 15% of the global amount of electronic waste (7.9 Mt) was generated within the 27 countries of the European Union [1]. WEEE is a waste stream containing both valuable raw materials and toxic substances that pose a threat to human health and the environment (e.g., Cd, Cr, Pb, Hg, Mn, Ni or organic flame retardant compounds). The specific composition of electronic waste means that it must be treated in a way that prevents the uncontrolled emission of toxic components into the environment. To reduce the negative impact of electronic waste and provide economic benefits,

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it is necessary to implement recycling and reuse strategies for electrical and electronic equipment. Sustainable WEEE management is an important element of a closed-loop economy. The effectiveness of the implementation of these strategies depends on several factors, such as treatment technologies, existing infrastructure, environmental policies, or consumer behaviour. Furthermore, the informal recycling of electronic waste is a major problem in developing countries [2]. From a global perspective, it is very difficult to compete economically with informal operators specialising in the collection and treatment of e-waste. Both workers in the informal sector and workers in specialised facilities are exposed to harmful substances emitted during the treatment of electronic waste [3–5]. Adequate worker protection is an important cost of WEEE treatment. However, health and safety regulations apply only in the formal sector. This situation results in some e-waste being illegally exported to developing countries without formal collection systems [6, 7]. As a consequence, this waste is very often deposited in landfills.

In 2019, approximately 4.5 Mt of e-waste was collected in the EU27 (about 57% of the mass of generated waste). Of this amount, 3.7 Mt (81% of the mass of e-waste collected) was recycled and prepared for reuse [8]. According to Directive 2012/19/EC, since 2016, the minimum collection rate for electronic waste within the EU is 45% of the average weight of electrical and electronic equipment (EEE) placed on the market in the three previous years. From 2019, the established minimum collection rate is as high as 65% of the average weight of EEE put on the market in the three preceding years or 85% of the weight of WEEE generated. It should be noted that Bulgaria, the Czech Republic, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovenia, and Slovakia, due to, i.a., infrastructure deficiencies, have been obliged to achieve, as of 2016, a minimum collection rate of 40% of the average weight of EEE placed on the market in the previous three years. However, the targets applicable from 2019 onwards, the aforementioned countries were obliged to achieve by 14 August 2021. It should be noted that the Extended Producer Responsibility (EPR) law established in the EU requires producers and distributors of EEE to finance collection and recovery schemes. Furthermore, in the case of household electronic waste, distributors delivering a new product must provide free collection of the same type of appliances.

For small WEEE, free-of-charge collection must also be provided by retail stores with a sales area of at least 400 m^2. According to data published by Eurostat [8], in 2020, the WEEE collection rate in the EU (27 countries) was 45.9% of the average weight of EEE placed on the market in 2017–2019. Despite many years of efforts to protect the environment, only three countries (Bulgaria, Croatia and Finland) achieved a 65% collection rate of e-waste in 2020. Nevertheless, the collection of e-waste within the EU (about 57% by weight of generated waste) far exceeds the levels achieved in other parts of the world (e.g., Asia about 12%, Americas about 9%, Africa about 1%) [1]. In many countries, the effectiveness of e-waste collection efforts is disproportionate to the growth rate of devices placed on the market. This situation results in a significant amount of the raw materials contained in e-waste being irretrievably wasted.

Taking into account the challenges facing the world in terms of e-waste management, it seems necessary to intensify the implementation of a circular economy strategy. In particular, this concerns measures affecting: extending the life of products through eco-design, reuse, repair, or refurbishment. The goal of closing the life cycle of electrical and electronic equipment is also important due to the availability of raw materials [9]. This is particularly true for the so-called critical elements for the EU economy. China's export restrictions on gallium and germanium have forced EU countries to increase not only the lifespan of devices but also the efficiency of e-waste recycling, among other things.

The so-called hibernation period, which includes the storage of devices until they are placed on the market and the storage by users of devices after the end of their service life (until they are discarded), is an important stage affecting product lifespan. The most common storage is for IT equipment or smartphones. Very often, these devices are retained as backup devices in case of failure of the equipment currently in use [10, 11].

An important stage in the product's lifespan is also the reuse of still-functioning equipment. In the case of reuse, technological developments that directly affect the functionality of devices and the elimination of the use of those still in working order are important factors. This problem mainly concerns IT equipment or smartphones. However, in the case of household appliances, we very often look for new equipment based on the same technology. Furthermore, Dindarian et al. [12] showed that, among other things, a significant proportion of microwave ovens discarded by consumers were in working order or required minor repairs. Another important factor is the attitude of consumers towards buying second-hand products. A study by the European Commission showed that a very small proportion of consumers (about 10%) have experience with leasing/renting or buying used products [13]. The practice of repair is also an important element of the circular economy. Its use, in addition to economic factors related to the cost of remediation, is determined by its ease of implementation, accessibility, and the timing of its implementation by external providers [13, 14].

This article complements research on consumer behaviour towards electronic waste. Currently, most of the research focuses on the analysis of consumer practices towards e-waste, with limited evaluation of consumer attitudes towards the purchase and operation of used equipment. The reuse of equipment has a direct impact on the amount of electronic waste generated, while the e-waste management practices of consumers have a direct impact on the recovery of the raw materials contained in the equipment. The aim is to assess the willingness of consumers to use used electrical and electronic equipment.

2. MATERIALS AND METHODS

The main objective of the conducted research was to assess consumer attitudes towards the purchase and utilisation of second-hand appliances and to verify these attitudes according to age, gender, and place of residence. The research was carried out

using an electronic form. The questions were sent to residents via email or social networks. The survey was anonymous. It consisted of open and closed questions of single and multiple choice. The survey was considered valid only if all the questions were answered.

To identify habits and practices related to used EEE, residents were asked if they happen to buy used appliances, and what type of appliances it is (large household appliances, small household appliances, audio equipment, IT equipment). An attempt was also made to assess the scale of the WEEE storage problem, including the reasons for such behaviour.

The first study area of the research included the small town of Jawor with a population of 21 077 (as of 30 June 2022) and the rural commune of Męcinka (5126 inhabitants as of 30 June 2022) – the so-called urban-rural area. The other study area was the city of Wrocław – the third largest city in Poland (673 923 inhabitants as of 30 June 2022) – a so-called big city. Wrocław is also one of the largest academic centres in Poland. In the academic year 2022/2023, the number of students was more than 106 000.

The questionnaire form consisted of several sections covering the social and demographic characteristics of the respondents; consumer awareness of the raw material potential, as well as the risks of inappropriate handling of WEEE; and assessment of behaviour related to the re-use of EEE and affecting the recycling of WEEE (extent of WEEE storage in households).

The study was conducted in September 2022. A total of 106 surveys were conducted in the area of Jawor and the municipality of Męcinka, and 121 surveys in the city of Wrocław. Data from 103 and 109 complete forms, respectively, were analysed. All incomplete questionnaires were discarded.

3. DISCUSSION OF THE SURVEY RESULTS

3.1. CHARACTERISTICS OF THE RESPONDENTS

The sociodemographic characteristics of the respondents in the two study areas are summarised in Figs. 1 and 2. Most of the respondents, 64.6%, were women and 35.4% were men. The largest age group (34.0%) was 18–30 years old. On the contrary, the lowest number of respondents (18.4%) was in the 61–65 age group (Fig. 3). The areas surveyed differed significantly in terms of the proportion of respondents in each age group. In the survey carried out in the Wrocław area, respondents aged 18–30 were the predominant group (51.4%). It should be noted that Wrocław is one of the largest academic centers in Poland. Students are quite willing to participate in several social surveys (Fig. 2). In general, students accounted for 24% of respondents in the Wrocław area. However, in the urban-rural area, the two age groups 31–40 and 41–50 had identical proportions of respondents (31.1% each).

The majority of the respondents were university graduates (61.3%). The respondents in the large city were better educated than the respondents in the urban-rural area. Almost 70% of the respondents in the large city area had a university degree. The proportion of respondents with vocational training in the two areas was comparable at around 5% (Fig. 3).

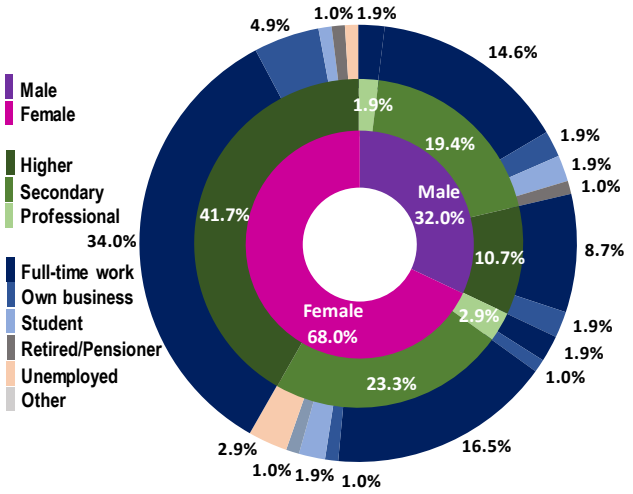

Fig. 1. Demographic characteristics of the urban-rural population

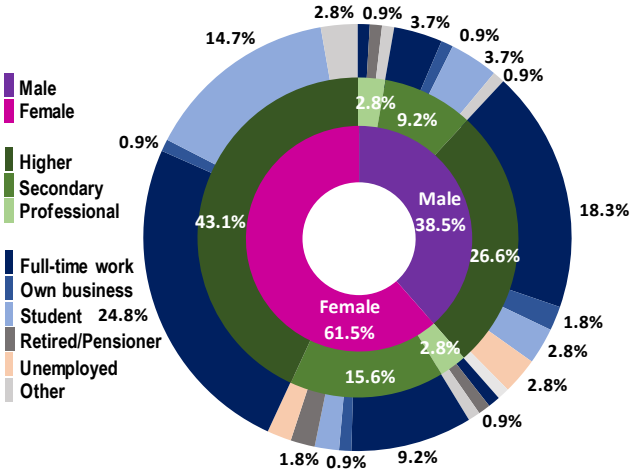

Fig. 2. Demographic characteristics of large city residents

Most of the respondents lived in multifamily dwellings (70.3%). This was particularly true for respondents who came from a large city (87.2%). For respondents from an urban-rural area, there was a much higher proportion of single-family housing (47.6%).

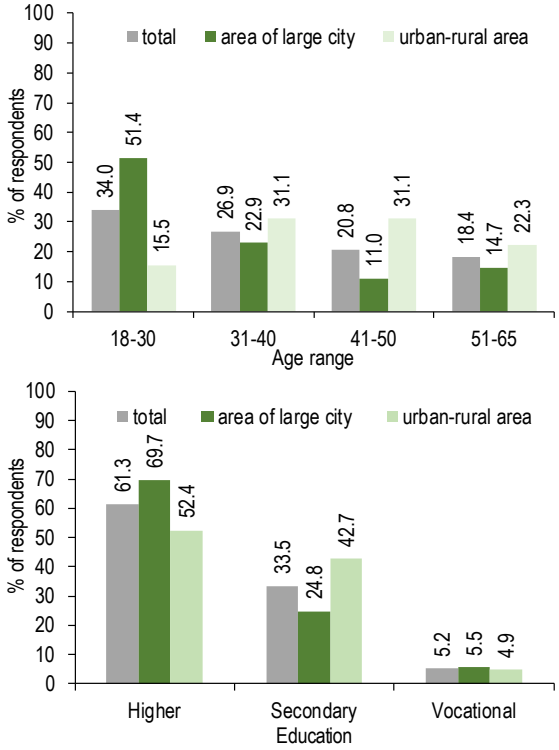

Fig. 3. Characteristics of respondents by age group and education

3.2. EDUCATION CAMPAIGNS AND CONSUMER AWARENESS

The basis for a well-functioning separate collection system for WEEE is consumer knowledge and awareness, including the dangers of improper handling of waste equipment. The respondents (93.4%) were aware that WEEE poses a threat to human health and the environment. Regarding the harmfulness of electronic waste, the results were similar for the large city (91.7%) and the urban-rural area (95.1%). When analysing behaviour by gender, slightly more men (94.7%) than women (92.7%) were aware of the risks.

Respondents were also aware of the presence of valuable raw materials in electrical and electronic equipment (87.7%), including 89.0% of respondents from the large city area as well as 86.4% from the urban-rural area. Again, there were slight gender differences. On average, 89.3% of men and 86.9% of women were aware of the presence of valuable raw materials in WEEE. Data for individual areas showed opposite trends and greater variation in the urban-rural area. 90.9% of men and 84.3% of women in the urban-rural area and 88.1% of men and 89.6% of women in the large city were knowledgeable about valuable components.

Regrettably, high awareness of hazardous substances does not always translate into proper handling of electronic waste. Despite the obligation of separate collection and educational activities carried out by equipment producers or information and educational campaigns, to which municipalities are obliged, only 65.1% of the respondents were informed about the obligation and principles of separate collection of WEEE (respectively, 60.6% in the large city and 69.9% in the urban-rural area). It should be noted that the provision of information to consumers does not always have a direct impact on the handling of WEEE.

The gender-based behavioural studies showed that information on the principles of separate collection was received more often by women (66.4%) than by men (62.7%). This trend was consistent for both areas analysed. In the large city area, 59.5% of men and 61.2% of women confirmed receiving information, while in the urban-rural area, 66.7% of men and 71.4% of women confirmed receiving it.

In the case of WEEE from households, residents have, for example, the possibility of delivering their waste free of charge to a municipal solid waste selective collection point (MSWCP) operated by the municipality. The study showed that 90.6% of respondents knew what MSWCP was (including respectively 88.1% of respondents from a large city and 93.2% of respondents from an urban-rural area). Unfortunately, only 36.7% of respondents from the large city area knew the location of the MSWCP. This is due, among other things, to the high proportion of students in the group of respondents and young people living in Wrocław for a short time. It should also be noted that Wrocław, with over 670 000 inhabitants, has only two such points. In the case of the urban-rural area, up to 71.8% of the respondents knew the location of such a point.

Consumer education and awareness have a significant impact on consumer behaviour. As a result, this has a bearing on the effectiveness of circular economy measures. Therefore, both introducers, recyclers, and municipalities responsible for municipal waste management should continue to conduct intensive campaigns promoting sustainable consumption attitudes.

3.3. HIBERNATION OF UNUSED DEVICES

Most of the respondents (63.7%) confirmed that they store devices at home that they do not use. These were largely residents of a large city (68.8%) and to a lesser extent respondents from an urban-rural area (58.3%). The observed differences may be attributed to the greater awareness of residents of the collection of legal electronic waste. On the other hand, the study did not show significant differences in respondents' behaviour depending on the type of housing (single-family or multi-family). For both analysed areas, a higher degree of equipment storage was recorded for residents of multi-family developments. For the small town and rural area, 55.1% and 61.1% of respondents, respectively, living in single-family and multifamily developments confirmed the storage.

For the large city analysed, this behaviour was indicated by 64.3% of respondents from single-family housing and 69.5% of respondents from multifamily housing.

On the other hand, the analysis of the gender variable for the whole area did not show significant differences in behaviour. The storage of household appliances was confirmed by 64.2% of women and 62.7% of men. However, differences were found for individual areas. In a large city, women are less likely to collect used appliances (67.2%). The figure for men is 71.4%. The urban-rural data showed the opposite trend. Appliance hibernation was confirmed by 51.5% of men and 61.4% of women.

In the study, respondents were asked which appliances they store most often in their homes. They were given a choice of several groups of appliances: large household appliances ((LHA); refrigerators, washing machines, dishwashers, cookers, etc.); small household appliances ((SHA); vacuum cleaners, toasters, irons, etc.); light sources ((LS); light bulbs, fluorescent lamps); information technology equipment ((IT); computers, printers, etc.); audio-video equipment (AV) and mobile phones and smartphones (MP/SP). The least frequently stored equipment groups indicated by the respondents include LHA and LS (Fig. 4). Meanwhile, the devices that respondents most frequently store at home are MP/SP (42.0% of respondents on average); IT (29.2% of respondents on average) and SHA (24.5% of respondents on average).

Hibernation of equipment has a direct impact on the availability of raw materials on the market. This behaviour also limits efforts to remanufacture components or reuse products. The level of hibernation varies depending on the type of device and the country [10, 11]. The most hibernated devices are cell phones. Their hibernation levels can range from more than 40% to more than 80% [15–17].

The research did not show significant differences in the storage of specific groups of equipment depending on the place of residence, whether it is a large city, a small town, or a rural area (Fig. 4).

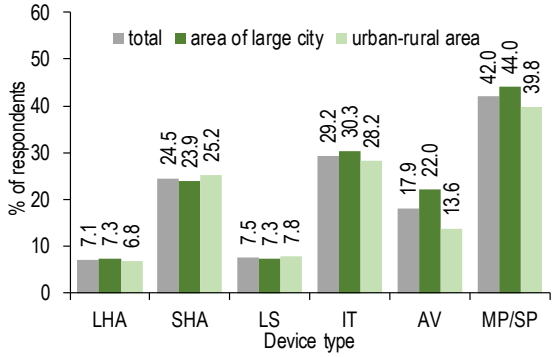

Fig. 4. Types of devices stored by respondents

In contrast, the analysis of the gender variable revealed differences in the type of equipment stored (Table 1). Data from all forms showed that men tend to store LS (8.0%

vs. 7.3%) and AV (24.0% vs. 14.6%) more frequently. In contrast, for the large city area and the urban-rural area, different trends were noted for the three device types (LHA, LS and AV). In the large city area, it is men who are more likely to store LHA (9.5%), LS (11.9%) and AV (26.2%). For the urban-rural area, men are more likely to store only AV equipment (21.2%).

Table 1

Type of stored devices depending on the gender

Device	Area of a large city		Urban-rural area		Total	
	Female	Male	Female	Male	Female	Male
	Percent of female/male respondents					
LHA	6.0	9.5	8.6	3.0	7.3	6.7
SHA	28.4	16.7	27.1	21.2	27.7	18.7
LS	4.5	11.9	10.0	3.0	7.3	8.0
IT	34.3	23.8	28.6	27.3	31.4	25.3
AV	19.4	26.2	10.0	21.2	14.6	24.0
MP/SP	44.8	42.9	44.3	30.3	44.5	37.3

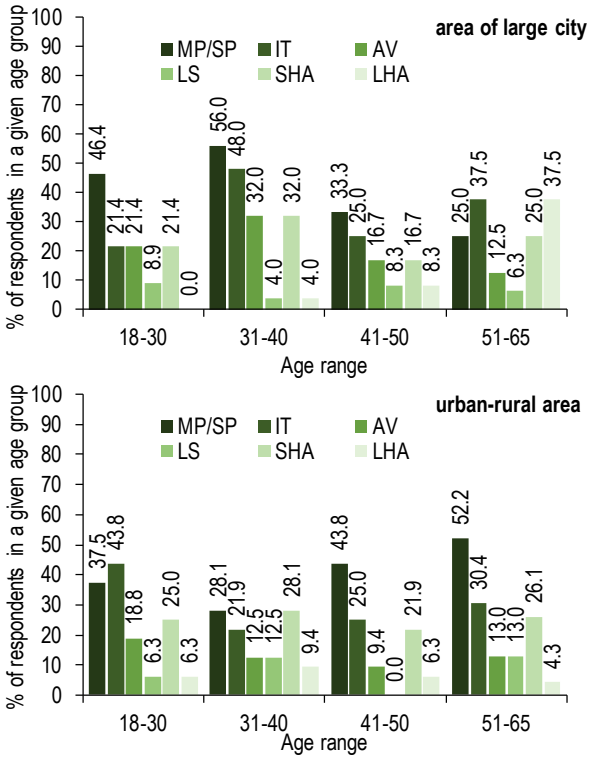

Fig. 5. Type of stored devices depending on the age of respondents

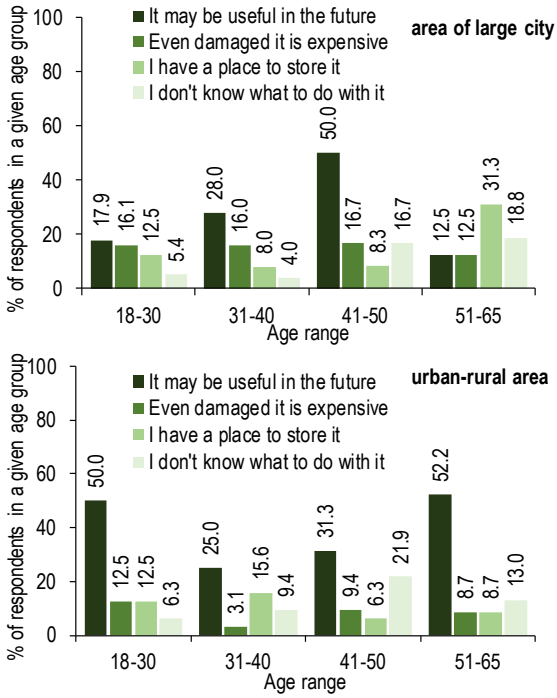

Fig. 6. Reasons for storing devices
depending on the age of the respondents

Similarly, the analysis of the device storage behaviour according to the age of the respondents has already shown some differences between the areas considered (Fig. 5). In this case, individual circumstances and preferences are of great importance (Fig. 6). In the large city area, the 31–40-year-old respondents were the group of people who most often collected in their homes MP/SF (56.0% of the respondents of the respective age group); IT (48%), AV (32%) and SHA (32%). On the contrary, in the urban-rural area, there was a wide variation by type of equipment. For example, the respondents aged 51–65 were most likely to store MP/SF (52.2% of the respondents of the age group), while those aged 18–30 were most likely to store IT (43.8%) and AV (18.8%) equipment. Those aged 31–40 were more likely to store SHA (28.1% of the respondents in the respective age group). Differences in the behaviour of the age groups concerned with particular types of equipment may result from factors such as disposable income (household's available income) and frequency of equipment replacement. In 2022, disposable income per person in cities with >500 000 inhabitants was, respectively, 23.3% and 34.2 % higher for cities with 20 000–99 000 and rural areas [18].

The main reason for storing equipment indicated by 29.7% of the respondents was the possibility of reusing it in the future (22.9% of respondents in the large city area and 36.9% in the urban-rural area, respectively). Reuse mainly concerns MP/SP or IT and

is largely due to their relatively short lifespan. In the case of MP/SP, this has to do with the duration of the contracts offered by the operators (24–36 months). Ultimately, however, these devices, although still working, are stored and never reused. In Switzerland, for example, only 15% of mobile phones are reused [19]. In many cases, old devices such as MP/SP serve as a data archive in case the currently used equipment fails. To counteract this way of dealing with MP/SM, among others, more and more operators are running buy-back programmes for used units.

Studies of the gender variable also showed differences in the reasons for hibernating equipment in each area. On average, 32.0% of men and 28.5% of women thought the equipment could be useful in the future (Table 2). However, a higher percentage of women (12.4%) compared to men (8.0%) did not know how to manage the used equipment. It should be noted that in this instance, the behaviour of women in the urban-rural area had a significant impact. The lack of knowledge about how to manage WEEE was indicated by up to 17.1% of women in this area. In the case of a large city, the trends were the opposite and at a much lower level (7.5% of women and 9.5% of men did not know what to do with waste equipment).

Table 2

Reasons for storing devices according to gender

Reason	Area of a large city		Urban-rural rea		Total	
	Female	Male	Female	Male	Female	Male
	Percent of female/male respondents					
It may be useful in the future.	22.4	23.8	34.3	42.4	28.5	32.0
Even damaged it is expensive	13.4	19.0	8.6	6.1	10.9	13.3
I have a place to store it	14.9	11.9	10.0	12.1	12.4	12.0
I don't know what to do with it	7.5	9.5	17.1	6.1	12.4	8.0

Analysing the different age groups, the highest level of appliance storage for reuse potential was recorded in the case of a large city for those 41–50 years old (50% of the respondents in the respective age group). Whereas in the urban-rural area, appliance storage due to its potential for further use was most frequently indicated by respondents aged 18–30 (50% of respondents in the age group) and 51–65 (52.2% of respondents in the age group) (Fig. 6).

Another reason for storing equipment, indicated by 11.8% of respondents, was the high value of the equipment (15.6% of respondents in the large city area and 7.8% in the urban-rural area, respectively). The differences noted for the analysed areas may directly result from the value of the purchased appliances and the frequency of their replacement. In the big city area, the highest levels of keeping valuable appliances were recorded for three age groups: 18–30 years (16.1% of the age group respondents); 31–40 years (16.0% of the age group respondents) and 41–50 years (16.7% of the age group respondents) (Fig. 6). In turn, this behaviour is closely related to the amount of income.

According to an analysis by the Polish Economic Institute, the highest income in Poland is earned by citizens in the age group 25–49 [20]. Also, the storage of expensive equipment is often done in connection with an attempt to sell it and recover some of the funds. In a large city area, the likelihood of reselling used appliances is higher due to the higher potential of buyers.

The size of the household is also an important factor influencing the hibernation of the appliance. The results showed that 12.3% of the respondents (respectively 13.7% of the respondents in the large city area and 10.7% of the respondents in the urban-rural area), store appliances because they have sufficient space. However, it should be noted that of the appliances analysed, small appliances such as MP/SF and IT are most often stored at home (Fig. 5).

Despite information and education campaigns, 10.8% of the respondents (respectively 8.3% of the respondents from a large city area and 13.6% of the respondents from an urban-rural area) did not know what to do with WEEE. The 41–50 age group had a significant impact on the value of the aforementioned indicator in small urban and rural areas. Exactly 21.9% of the respondents in the age group 41–50 did not know what to do with their appliances. In the case of the large city area, 16.7% of the respondents aged 41–50 indicated a lack of knowledge on how to manage WEEE was indicated by 16.7% of respondents aged 41–50. The results indicate that this group should be covered by a dedicated information and education campaign on legal ways of disposing of electronic waste.

3.4. CONSUMER ACCEPTANCE OF APPROACHES FOR DEVICES LIFETIME EXTENSION

The extension of the life of electrical and electronic equipment is an important part of its sustainable management. Longer equipment lifespans can result from both hibernation and reuse. From an environmental perspective, the design of more durable appliances has an important impact on reducing the demand for raw materials. However, the lifespan of equipment depends on its type, technical condition, the dynamics of technological progress (loss of functionality and performance), and psychological (fashion) and economic aspects (high maintenance and repair costs). A final important factor that determines the useful life of a product is deliberate obsolescence [21]. It is also essential to be aware of the boundary between the performance and functionality of the equipment and its extended lifespan. For example, advances in technology and greater energy efficiency of appliances can make replacing a fridge that is several years old a better option than trying to repair it. Current reuse rates for many types of appliances, including smartphones, are low [22].

The active reuse of devices also depends on consumer behaviour. They are responsible for deciding whether to buy used devices or to hibernate unused devices and pass them on to the next user. In the survey, the majority of the respondents (62.3%) admitted that they do not buy used EEEs (56.9% of the respondents in the large city area and

68.0% in the urban-rural area, respectively). This trend was true for all age groups in the urban-rural area. In the case of the large city area, the opposite trend was observed for the 31–40 age group. Exactly 68.0% of respondents aged 31–40 indicated that they buy second-hand appliances (Fig. 7). Analysis of the gender variable showed that men (40.0%) were more likely to buy second-hand appliances compared to women (36.5%). This trend was identical in both the big city (45.2% men and 41.8% women) and the urban-rural area (33.3% men and 31.4% women).

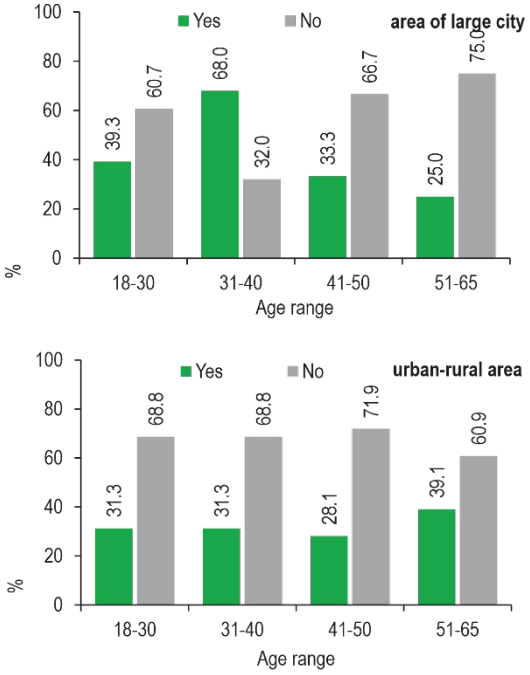

Fig. 7. Respondents' willingness to purchase used devices

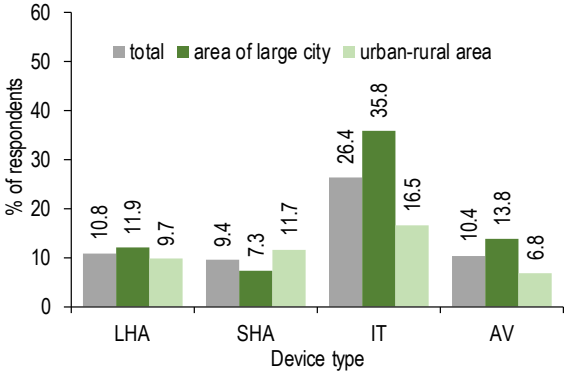

Fig. 8. Types of used devices purchased by respondents

The research in terms of the type of equipment purchased showed that respondents most often opt for IT equipment (26.4%, 35.8% of respondents in the large city area, and 16.5% in the urban-rural area, respectively) (Fig. 8). Respondents are less likely to decide to buy and use second-hand SHA (9.4%). A study by Nowakowski [10] found that these devices are also rarely kept due to the possibility of reuse.

The analysis of the gender variable shows that, of the used equipment analysed (LHA, SHA, IT and AV), IT and AV equipment are more frequently purchased by men (34.7% and 18.7% of men, respectively). The other types of equipment are purchased more frequently by women (Table 3). This is true for both the large city area and the urban-rural area. It should also be noted that men in the city area (40.5%) are significantly more likely to buy second-hand IT equipment compared to men in the urban-rural area (27.3%).

Table 3

Types of used devices purchased by respondents depending on gender

Device	Area of large city		Urban-rural area		Total	
	Female	Male	Female	Male	Female	Male
	Percent of female/male respondents					
LHA	16.4	4.8	14.3	0.0	15.3	2.7
SHA	9.0	4.8	12.9	9.1	10.9	6.7
IT	32.8	40.5	11.4	27.3	21.9	34.7
AV	10.4	19.0	1.4	18.2	5.8	18.7

Analysing various age groups (Fig. 9), 31–40 respondents were the most likely to purchase used IT equipment (60.0% and 21.9% of the respondents in the age group in the large city and urban-rural area, respectively). Concerning IT equipment, the differences between the large urban and urban-rural areas analysed were quite significant. It should be noted that in the case of a large city, we are very often dealing with young people buying used IT equipment as a temporary solution. This results, among other things, from migration to the city and limited funds due to the initial high cost of maintenance in the city. Often the reason for replacement is the failure of the equipment they have and the need to meet immediate needs. The greater availability of refurbished equipment from premium brands that, when new, may be beyond their financial reach is also important. For most age groups in both areas, SHA and LHA were the most rarely purchased devices.

The survey confirmed that the main reason for buying used equipment was the opportunity to purchase virtually new units at a lower price (26.9% of the respondents; 33.9% of the respondents from the large city area and 19.4% from the urban-rural area, respectively) (Fig. 10). It should also be noted that only 10.4% of the respondents (12.8% of the respondents from the large city area and 7.8% from the urban-rural area) indicated that the reason for the purchase was the lack of funds to buy a new unit.

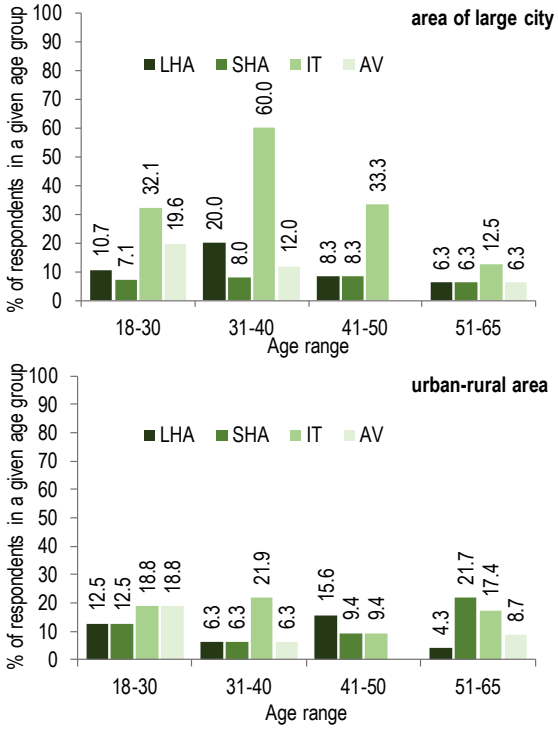

Fig. 9. Types of used devices purchased by respondents depending on the age

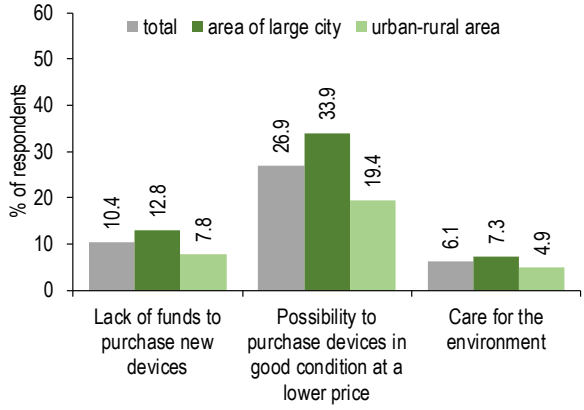

Fig. 10. Reasons for purchasing devices used by respondents

The analysis of the gender variable shows that men (29.3%) more often decide to purchase used than women (25.5%) due to the lower price (Table 4). Such behaviour concerns the large city area (35.7% of men and 32.8% of women) and the urban-rural

area (21.2% of men and 18.6% of women). In turn, when purchasing used equipment, women (8.0%) took environmental factors into account more often than men (2.7%). This trend was identical in both areas analysed.

Table 4

Reasons for purchasing used devices by respondents depending on the gender

Reason	Area of a large city		Urban-rural area		Total	
	Female	Male	Female	Male	Female	Male
	Percent of female/male respondents					
Lack of funds to purchase new devices	13.4	11.9	7.1	9.1	10.2	10.7
Possibility to purchase devices in good condition at a lower price	32.8	35.7	18.6	21.2	25.5	29.3
Care for the environment	10.4	2.4	5.7	3.0	8.0	2.7

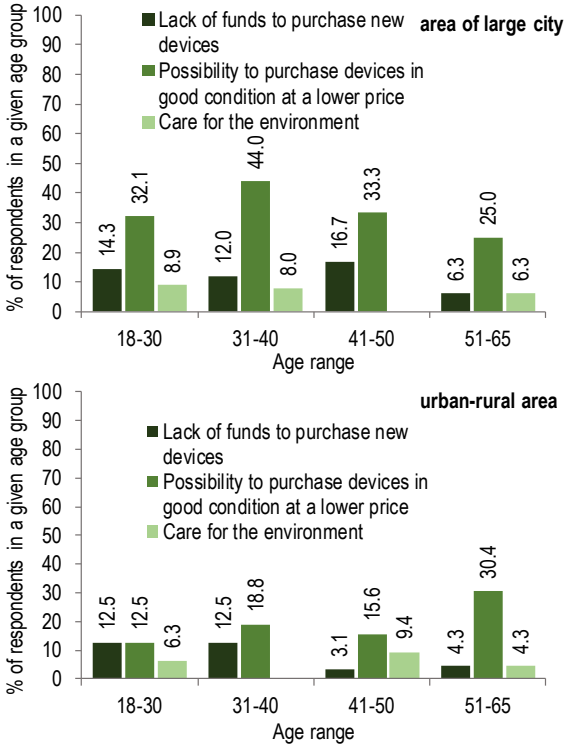

Fig. 11. Reasons for purchasing devices used by respondents depending on age

Analysis of the behaviour of different age groups showed significant differences between the large city and urban-rural areas (Fig. 11). In the case of the large city, up to 44.0% of respondents in the age group 31–40 confirmed that the opportunity to buy

virtually new appliances at a lower price was the main reason for buying used equipment. In the urban-rural area, on the other hand, only 18.8% of respondents in the 31–40 age group indicated this factor. Similarly, for the 18–30 and 41–50 age groups, respectively, 32.1% and 33.3% of those in the group in the large city area bought used appliances for the analysed reason. In the urban-rural area, the rate for the above-mentioned age groups was more than twice as low (Fig. 11). In the case of young people, this course of action allows them to satisfy their technological needs despite some financial constraints. Very often, young people choose to buy used premium brands, more technologically advanced compared to new devices from cheaper manufacturers. In this case, psychological aspects are also important, the influence of the environment (preferences of peers) and fashion. The increased interest in technology and the willingness to test solutions from different manufacturers are also not insignificant.

Unfortunately, environmental aspects were the least important to consumers, 6.1% (respectively, 7.3% of the respondents were from a large city area and 4.9% from an urban-rural area). Despite many information and education campaigns on sustainability, consumers' decisions are still directly driven by economic aspects.

4. CONCLUSIONS

Low rates of reuse of electrical and electronic devices mean that a significant portion of them are discarded prematurely. It is possible to increase the reuse of appliances, but it depends on their quality and functionality. The greatest potential in this regard lies with premium brands, whose exclusion due to technological advances occurs much later. The survey confirmed that the respondents are willing to engage in reuse practices. To a large extent today, this is still due to financial considerations and personal preferences. For young consumers, the preferences of peers or the online community may play an important role in shaping their choices. Whereas the analysis of the gender variable showed that men are less likely to consider environmental factors when purchasing used appliances.

Respondents' low involvement in appliance reuse is also a consequence of an underdeveloped market for servicing, repairing, and refurbishing used appliances. There is also a lack of efforts to promote the extension of the useful life of equipment dedicated to specific age groups. Another important challenge is to encourage consumers to donate appliances for reuse or recycling instead of storing them.

Only proper handling of WEEE by residents and properly conducted selective collection of appliances ensures the closure of the waste management system. Such activities are part of the idea of a closed-loop economy.

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